126-TRC-09-004

SAFETY COMPLIANCE TESTING FOR FMVSS 126
Electronic Stability Control Systems

Toyota Motor Corporation
2009 Lexus ES350
NHTSA No. C95104

TRANSPORTATION RESEARCH CENTER INC.
10820 State Route 347
East Liberty, Ohio 43319

April 30, 2009

FINAL REPORT

Prepared Under Contract No.: DTNH22-08-P-0097

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
1200 New Jersey Avenue, SE
West Building, 4th Floor (NVS-221)
Washington, DC 20590

Prepared for the Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-08-P-0097.

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16. Abstract A test was conducted on a 2009 Lexus ES350, NHTSA No. C95104, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-126-02 for the determination of FMVSS 126 compliance. Test failures identified were as follows: None			
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1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this test is to determine if the test vehicle, an MY 2009 Lexus ES350 meets the minimum equipment and performance requirements stated in Federal Motor Vehicle Safety Standard (FMVSS) 126, "Electronic Stability Control Systems."

This standard establishes performance and equipment requirements for Electronic Stability Control (ESC) Systems installed in passenger cars, multipurpose passenger vehicles, trucks and buses with a gross vehicle weight rating of 4,536 kilograms or less.

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS

Testing of the MY 2009 Lexus ES350 was conducted at Transportation Research Center Inc. (TRC Inc.) in accordance with NHTSA TP-126-02, dated November 19, 2008.

The vehicle was inspected to ensure it was equipped with an ESC System that:

- Augments vehicle directional stability by applying and adjusting brake torques individually at each wheel to induce a correcting yaw moment to a vehicle;
- Is computer controlled with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer;
- Has a means to determine the vehicle's yaw rate and to estimate its side slip or side slip derivative with respect to time;
- Has a means to monitor driver steering inputs;
- Has an algorithm to determine the need, and a means to modify engine torque, as necessary, to assist the driver in maintaining control of the vehicle, and
- Is operational over the full speed range of the vehicle (except at vehicle speeds less than 15km/h (9.3mph) or when being driven in reverse).

The vehicle was subjected to a 0.7Hz sine with dwell (SWD) steering maneuver to ensure that it would meet the stability and responsiveness requirements of the standard as follows:

- At 1.0 second after completion of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 35 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).
- At 1.75 seconds after completion of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 20 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).
- The lateral displacement of the vehicle center of gravity with respect to its initial straight path must be at least 1.83 m (6 feet) (for vehicles with a GVWR of 3,500kg (7,716 lb) or less) when computed 1.07 seconds after the Beginning of Steer (BOS) at the specified steering wheel angles.

System malfunction simulations were executed to verify vehicle could identify and indicate a malfunction.

The vehicle's ESC System appears to meet the performance and equipment requirements as required by FMVSS 126. The test results are summarized on the following summary sheet.

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS ...continued

DATA SUMMARY (Sheet 1 of 2)

VEHICLE MAKE/MODEL/BODY STYLE: Lexus / ES350 / Passenger car

VEHICLE NHTSA NO.: C95104 VIN: JTHBJ46GX92295416

VEHICLE TYPE: Passenger car DATE OF MANUFACTURE: 10/08

LABORATORY: Transportation Research Center Inc.

REQUIREMENTS	PASS/FAIL
ESC Equipment and Operational Characteristics (Data Sheet 2)	
The vehicle is to be equipped with an ESC system that meets the equipment and operational characteristics requirements. (S126, S5.1, S5.6)	PASS
ESC Malfunction Telltale (Data Sheet 3)	
The vehicle is equipped with a telltale that indicates one or more ESC system malfunctions. (S126, S5.3)	PASS
"ESC Off" and other System Controls and Telltale (Data Sheet 3 & 4)	
The vehicle is equipped with an ESC off telltale indicating the vehicle has been put into a mode that renders the ESC System unable to satisfy the performance requirements of the standard, if such a mode exists. (S5.5.1)	SEE REMARKS

REMARKS:
This vehicle is not equipped with a dedicated switch with the sole purpose of deactivating the ESC System.

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS ...continued

DATA SUMMARY (Sheet 2 of 2)

REQUIREMENTS	PASS/FAIL
If provided, off control and other system controls as well as the ESC off telltale meets the operational requirements (S126, S5.4, S5.4.1, S5.4.2, S5.5.4, and S5.5.9)	SEE REMARKS

Vehicle Lateral Stability (Data Sheet 8)

Yaw Rate Ratio at 1 second after COS is less than 35% of peak value. (S126, S5.2.1)	PASS
Yaw Rate Ratio at 1.75 seconds after COS is less than 20% of peak value. (S126, S5.2.2)	PASS

Vehicle Responsiveness (Data Sheet 8)

Lateral displacement at 1.07 seconds after BOS is at least 1.83 m (6 feet) for vehicles with a GVWR of 3,500kg (7,716 lbs.) or less, and 1.52 m (5 feet) for vehicles with a GVWR greater than 3,500 kg (7,716 lbs.). (S126 S5.2.3)	PASS

ESC Malfunction Warning (Data Sheet 9)

Warning is provided to driver after malfunction occurrence. (S126. S5.3)	PASS
Malfunction telltale stayed illuminated as long as malfunction existed and must extinguished after malfunction was corrected. (S126, S5.3.7)	PASS

REMARKS:

This vehicle is not equipped with a dedicated switch with the sole purpose of deactivating the ESC system.

3.0 TEST DATA

DATA SHEET 1 (Sheet 1 of 2)
TEST VEHICLE INSPECTION AND TEST PREPARATION

VEHICLE MAKE/MODEL/BODY STYLE: Lexus / ES350 / Passenger car

NHTSA No.: C95104 TEST DATE: 4-23-09

VIN: JTHBJ46GX92295416 MANUFACTURE DATE: 08/08

GVWR: 2,122.8 KG FRONT GAWR: 1,210.2 KG REAR GAWR 1,070.0 KG

SEATING POSITIONS: FRONT 2 REAR 3

ODOMETER READING AT START OF TEST: 60 (96.6) Miles (Kilometers)

DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING:
Front Axle P215 / 55R 17 Rear Axle P215 / 55R 17

INSTALLED TIRE SIZE(S) ON VEHICLE:

From Tire Sidewall	Front Axle	Rear Axle
Manufacturer and Model	Bridgestone Turanza EL400	Bridgestone Turanza EL400
Tire Size Designation	P215 / 55R 17 93V	P215 / 55R 17 93V

Are installed tire sizes same as labeled tire sizes? X Yes _____ No
If no, contact COTR for further guidance.

DRIVE CONFIGURATIONS (MARK ALL THAT APPLY):
X Two Wheel Drive (2WD): (X) Front Wheel Drive ( ) Rear Wheel Drive
_____ All Wheel Drive (AWD)
_____ Four Wheel Drive Automatic – differential not locked full time (4WD Automatic)
_____ Four Wheel Drive High Gear Locked Differential (4WD HGLD)
_____ Four Wheel Drive Low Gear (4WD Low)
_____ Other (define _____)

3.0 TEST DATA....continued

DATA SHEET 1 (Sheet 2 of 2)
TEST VEHICLE INSPECTION AND TEST PREPARATION

DRIVE CONFIGURATIONS AND MODES: (ex. default, performance, off)
(For each of the vehicle's drive configurations identify available operating modes)

Drive Configuration 2WD - FWD
Mode(s) default

Drive Configuration _____
Mode(s) _____

Drive Configuration _____
Mode(s) _____

VEHICLE STABILITY SYSTEMS (Check applicable technologies):

X ESC	X Traction Control	____ Roll Stability Control
____ Active Suspension	X Electronic Throttle Control	____ Active Steering
X ABS		

List other systems; Electronic Brake Distribution (EBD)

REMARKS:

RECORDED BY: Alan Ida DATE: 4-23-09
APPROVED BY: Jeff Sankey DATE: 4-30-09

3.0 TEST DATA....continued

DATA SHEET 2 (Sheet 1 of 2)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

VEHICLE MAKE/MODEL/BODY STYLE: Lexus / ES350 / Passenger car

NHTSA No.: C95104 TEST DATE: 4-14-09

ESC SYSTEM IDENTIFICATION:
Manufacturer/Model Advics Co. Ltd. 44540-33220 (w/o ACC) & 44540-33230 (w/ ACC)

ESC SYSTEM HARDWARE (Check applicable hardware):

X Electronic Control Unit	X Hydraulic Control Unit
X Wheel Speed Sensors	X Steering Angle Sensor
X Yaw Rate Sensor	X Lateral Acceleration Sensor

List other components; Engine Control System, Master Cylinder Pressure Sensor

ESC SYSTEM OPERATIONAL CHARACTERISTICS:

System is capable of generating brake torques at each wheel
X Yes (PASS)
_____ No (FAIL)

List and describe component(s): ESC Computer
Hydraulic Control Unit
Master Cylinder Pressure Sensor

System is capable of determining yaw rate
X Yes (PASS)
_____ No (FAIL)

List and describe component(s): Yaw Rate Sensor

System is capable of monitoring driver steering input
X Yes (PASS)
_____ No (FAIL)

List and describe component(s): Steering Wheel Angle Sensor

System is capable of estimating side slip or side slip derivation
X Yes (PASS)
_____ No (FAIL)

List and describe component(s): Four Independent Wheel Speed Sensors
Steering Wheel Angle Sensor
Yaw Rate Sensor

3.0 TEST DATA....continued

DATA SHEET 2 (Sheet 2 of 2)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

ESC SYSTEM OPERATIONAL CHARACTERISTICS (continued):

System is capable of modifying engine torque during ESC activation. __X__ Yes (PASS)
_____ No (FAIL)

Method used to modify engine torque: ESC Computer and Engine ECU

System is capable of activation at speeds of 20 km/h (12.4 mph) and higher. __X__ Yes (PASS)
_____ No (FAIL)

Speed system becomes active. 15 km/h (9.3 mph)

System is capable of activation during the following driving phases (acceleration, deceleration, coasting, and during activation of ABS or traction control). __X__ Yes (PASS)
_____ No (FAIL)

Driving phases that the system is capable of activation. Forward direction accelerating, braking, coasting, ABS activation, TCS activation

Vehicle manufacturer submitted documentation explaining how the ESC system mitigates understeer? __X__ Yes (PASS)
_____ No (FAIL)

DATA INDICATES COMPLIANCE PASS/FAIL PASS

REMARKS:

RECORDED BY: Alan Ida DATE: 4-14-09
APPROVED BY: Jeff Sankey DATE: 4-30-09

3.0 TEST DATA....continued

DATA SHEET 3 (Sheet 1 of 5)
ESC MALFUNCTION AND OFF TELLTALES

VEHICLE MAKE/MODEL/BODY STYLE: Lexus / ES350 / Passenger car

VEHICLE NHTSA NO. C95104 TEST DATE: 4-03-09

ESC Malfunction Telltale

Vehicle is equipped with malfunction telltale? X Yes (Pass) _____ No (Fail)

Telltale Location Instrument cluster – left of tachometer.
Telltale Color yellow

Telltale symbol or abbreviation used.

Or **ESC**

_____ Vehicle uses this symbol
_____ Vehicles uses this abbreviation
X Neither symbol or abbreviation is used

If different than identified above, make note of any message, symbol or abbreviation used.

Uses the above symbol, however the symbol does not have mirrors; Also the Multi-Information Display will display the message "Check VSC"

Is telltale part of a common space? X Yes _____ No

Is telltale also used to indicate activation of the ESC system? X Yes _____ No

If yes, explain telltale operation during ESC activation: telltale symbol flashes and intermittent buzzer will sound

23. DATA SHEETS....continued

DATA SHEET 3 (Sheet 2 of 2)
ESC MALFUNCTION AND OFF TELLTALES

"ESC OFF" Telltale (if provided)

Vehicle is equipped with "ESC Off" telltale? _____Yes ___X__No

Is "ESC OFF" telltale combined with "ESC Malfunction" telltale utilizing a two part telltale
_____Yes _____No

Telltale Location ___N/A_____

Telltale Color _____N/A_____

Telltale symbol or abbreviation used.

Or **ESC OFF**

_____Vehicle uses this symbol
_____Vehicle uses this abbreviation
_____Neither symbol or abbreviation is used

If different than identified above, make note of any message, symbol or abbreviation used.

_____N/A_____

_____

Is telltale part of a common space? _____ Yes _____ No

DATA INDICATES COMPLIANCE PASS/FAIL __SEE REMARKS__
(Vehicle is compliant if equipped with a malfunction telltale)

REMARKS:

This vehicle is not equipped with a dedicated switch with the sole purpose of deactivating the ESC System.

RECORDED BY: __Alan Ida_____ DATE:___4/03/09_____
APPROVED BY: __Jeff Sankey_____ DATE:___4/30/09_____

3.0 TEST DATA....continued

DATA SHEET 4 (Sheet 1 of 3)
ESC AND ANCILLARY SYSTEM CONTROLS

"ESC OFF" Controls Identification and Operational Check:

Is the vehicle equipped with a control or controls whose purpose is to deactivate the ESC system or place the ESC system in a mode or modes that may no longer satisfy the performance requirements of the standard?

_____ Yes __X__ No

Type of control or controls provided? (mark all that apply)

_____ Dedicated "ESC Off" control
_____ Multi-functional control with an "ESC Off" mode
_____ Other (describe)

Identify each control location, labeling and selectable modes.

First Control:
Location N/A
Labeling N/A
Modes N/A

Second Control:
Location N/A
Labeling N/A
Modes N/A

Identify standard or default drive configuration N/A

Verify standard or default drive configuration selected. _____ Yes _____ No

Does the "ESC Off" telltale illuminate upon activation of the dedicated ESC off control or selection of the "ESC Off" mode on the multi-function control?

_____ Yes _____ No (fail)

Does the "ESC Off" telltale extinguish when the ignition is cycled from "On" ("Run") to "Lock" or "Off" and then back again to the "On" ("Run") position?

_____ Yes _____ No (fail)

If no, describe how the off control functions:

_____

_____

DATA SHEET 4 (Sheet 2 of 3)
ESC AND ANCILLARY SYSTEM CONTROLS

If a multi-function control is provided, cycle through each mode setting on the control and record which modes illuminate the "ESC Off" telltale. Also, for those modes that illuminate the ESC Off" telltale identify if the telltale extinguishes upon cycling the ignition system.

Control Modes	"ESC Off" telltale illuminates upon activation of control? (Yes/No)	"ESC Off" telltale extinguishes upon cycling ignition? (Yes/No)
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

For each mode that illuminates the "ESC Off" telltale, did the telltale extinguish when the ignition was cycled from "On" ("Run") to "Lock" or "Off" and then back again to the "On" ("Run") position?

_____ Yes _____ No (fail)

Other System Controls that have an ancillary effect on ESC Operation:

Is the vehicle equipped with any ancillary controls that upon activation may deactivate the ESC System or place the ESC System in a mode or modes that may no longer satisfy the performance requirements of the standard?

_____ Yes __X__ No

List and describe each control (i.e. alternate drive configuration selection controls):

Ancillary Control: System N/A
Control Description N/A
Labeling N/A

Ancillary Control: System N/A
Control Description N/A
Labeling N/A

3.0 TEST DATA....continued

DATA SHEET 4 (Sheet 3 of 3)
ESC AND ANCILLARY SYSTEM CONTROLS

Activate each control listed above and record whether the control illuminates the "ESC Off" telltale. Also, record warnings or messages provided regarding the ESC System.

Ancillary Control	Control Activates "ESC Off" Telltale? (Yes/No)	Warnings or Messages Provided
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

For those controls that illuminate the "ESC Off" telltale above identify if the "ESC Off" telltale extinguishes upon cycling the ignition system.

Ancillary Control	"ESC Off" telltale extinguishes upon cycling ignition? (Yes/No)
N/A	N/A
N/A	N/A
N/A	N/A

For each control that illuminates the "ESC Off" telltale, did the telltale extinguish when the ignition is cycled from "On" ("Run") to "Lock" or "Off" and then back again to the "On" ("Run") position? If the control activated places the vehicle into a low-range four-wheel drive configuration designed for low-speed, off–road driving, the ESC System may remain turned off after the ignition has been cycled off and then back on and therefore the "ESC Off" telltale may not extinguish.

_____ Yes _____ No (fail)

DATA INDICATES COMPLIANCE: PASS/FAIL PASS

REMARKS:

RECORDED BY: Alan Ida DATE: 4/03/09
APPROVED BY: Jeff Sankey DATE: 4/30/09

DATA SHEET 5 (Sheet 1 of 3)
VEHICLE AND TEST TRACK DATA

VEHICLE MAKE/MODEL/BODY STYLE: Lexus / ES350 / Passenger car

NHTSA No.: C95104 TEST DATE: 4-23-09

Test Track Requirements: Test Surface Slope (0-1 %) 1 %

Peak Friction Coefficient (at least 0.9) 0.9

Full Fluid Levels: Fuel X Coolant X Other Fluids Washer (specify)

Tire Pressures: **Required:** Front Axle 210.0 KPA Rear Axle 210.0 KPA
Actual: LF 210.0 KPA RF 210.0 KPA LR 210.0 KPA RR 210.0 KPA

Vehicle Dimensions: Track Width 158.4 cm Wheelbase 277.6 cm

Roof Height 143.2 cm

Vehicle weight ratings: GAWR Front 1,210 KG GAWR Rear 1,070 KG

Unloaded Vehicle Weight (UVW)

Front Axle 993.6 KG Left Front 483.5 KG Right Front 510.1 KG

Rear Axle 655.0 KG Left Rear 341.3 KG Right Rear 313.7 KG

Total UVW 1,648.6 KG

Baseline Weight and Outrigger Selection (only for MPVs, Trucks, Buses)

Calculated Baseline Weight (UVW+ 73 kg) N/A KG

Outrigger size required ("Standard" or "Heavy") N/A
Standard - Baseline weight under 2,722 kg (6,000 lbs)
Heavy - Baseline weight equal to or greater than 2,722 kg (6,000 lbs)

3.0 TEST DATA....continued

DATA SHEET 5 (Sheet 2 of 3)
VEHICLE AND TEST TRACK DATA

UVW with Outriggers (only for MPVs, Trucks, Buses)

Front Axle N/A KG Left Front N/A KG Right Front N/A KG

Rear Axle N/A KG Left Rear N/A KG Right Rear N/A KG

Total UVW w/ Outriggers N/A KG

Loaded Vehicle Weight w/ Driver and Instrumentation (No Ballast)

Front Axle 1,062.8 KG Left Front 524.8 KG Right Front 538.0 KG

Rear Axle 709.6 KG Left Rear 373.5 KG Left Rear 336.1 KG

Total Loaded weight w/ Driver 1,772.4 KG

Ballast Required = [**UVW** + 168 KG] - **Total Loaded Weight w/ Driver and Instrumentation**

= [1,648.6 KG + 168 KG] - 1,772.4 KG

= 44.2 KG

Total Loaded Vehicle Weight

Front Axle 1,077.7 KG Left Front 525.9 KG Right Front 551.8 KG

Rear Axle 738.9 KG Left Rear 383.7 KG Right Rear 355.2 KG

Total Loaded Vehicle Weight 1,816.6 KG

3.0 TEST DATA....continued

DATA SHEET 5 (Sheet 3 of 3)
VEHICLE AND TEST TRACK DATA

Center of Gravity and Inertial Sensing System Location at Loaded Vehicle Condition

x-distance (longitudinal) Point of reference is the front axle centerline.
(Positive from front axle toward rear of vehicle.)

y-distance (lateral) Point of reference is the vehicle centerline.
(Positive from the center toward the right.)

z-distance (vertical) Point of reference is the ground plane.
(Positive from the ground up.)

Locations:

	Center of Gravity	Inertial Sensing System
x-distance	112.9 cm	149.5 cm
y-distance	-0.12 cm	0.05 cm
z-distance	54.4 cm	48.4 cm

Distance Between Ultrasonic Sensors: 183.0 cm

TEST TRACK DATA MEETS REQUIREMENTS: YES/NO YES
If no, explain: _____

REMARKS:

RECORDED BY: Alan Ida DATE: 4-22-09
APPROVED BY: Jeff Sankey DATE: 4-30-09

3.0 TEST DATA....continued

DATA SHEET 6 (Sheet 1 of 3)
BRAKE AND TIRE CONDITIONING

VEHICLE MAKE/MODEL/BODY STYLE: Lexus / ES350 / Passenger car

VEHICLE NHTSA No.: C95104

Measured Cold Tire Pressures: LF 210 KPA RF 210 KPA

LR 210 KPA RR 210 KPA

Wind Speed 4.9 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 5.0 °C

Pre-Test Calibration Data

1-mile Distance Display Reading 5,288.7 feet

1-mile Distance Stopwatch Time 59.97 seconds

97 km/h (60 mph) Stead Speed Data File Number C95104_04232009_0000

Brake Conditioning Time; 8:41 AM Date; 4-23-09

56 km/h (35 mph) Brake Stops

Number of stops executed (10 required) 10 stops

Observed deceleration rate range (.5g target) 0.50 – 0.52 g

72 km/h (45 mph) Brake Stops

Number of stops executed (3 required) 3 stops

Number of stops ABS activated (3 required) 3 stops

Observed deceleration rate range 1.0 – 1.1 g

72 km/h (45 mph) Brake Cool Down Period

Duration of cool down period (5 minutes min.) 5:25 minutes

3.0 TEST DATA....continued

DATA SHEET 6 (Sheet 2 of 3)
BRAKE AND TIRE CONDITIONING

Tire Conditioning Series No. 1 Time: 9:10 AM Date: 4-23-09

Measured Tire Pressures: LF 213.7 KPA RF 220.6 KPA

LR 210.3 KPA RR 210.3 KPA

Wind Speed 1.8 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 5.6 °C

30 meter (100 ft) Diameter Circle Maneuver				
Test Runs	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (km/h)
1-3	Clockwise	0.5-0.6	0.55	47
4-6	Counterclockwise	0.5-0.6	0.55	45

1 Hz 3 Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle For 0.5-0.6g Lateral Acceleration				
Test Runs	Vehicle Speed Km/h(mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1	56±2 (35±1)	30	0.5-0.6	0.19
2	56±2 (35±1)	90	0.5-0.6	0.57
3	56±2 (35±1)		0.5-0.6	
4	56±2 (35±1)		0.5-0.6	

Steering wheel angle that corresponds to a peak 0.5–0.6g lateral acceleration; 90 degrees

1 Hz 10 Cycle Sinusoidal Steering Maneuver				
Test Runs	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1 - 3	56±2 (35±1)	90 (cycles 1-10)	0.5-0.6	0.55
4	56±2 (35±1)	90 (cycles 1-9)	0.5-0.6	0.55
		180 (cycle 10)*	N/A	0.86

* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.

3.0 TEST DATA....continued

DATA SHEET 6 (Sheet 3 of 3)
BRAKE AND TIRE CONDITIONING

Tire Conditioning Series No. 2 Time: 11:22 AM Date: 4-23-09

Measured Tire Pressures: LF 224.1 KPA RF 224.1 KPA
LR 217.2 KPA RR 217.2 KPA

Wind Speed 0.4 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 9.4 °C

30 meter (100 ft) Diameter Circle Maneuver				
Test Runs	Steering Direction	Target Lateral Acceleration (g)	Observed Lateral Acceleration (g)	Observed Vehicle Speed (km/h)
1-3	clockwise	0.5-0.6	0.55	47
4-6	counterclockwise	0.5-0.6	0.55	45

1 Hz 3 Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle For 0.5-0.6g Lateral Acceleration				
Test Runs	Vehicle Speed Km/h (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1	56±2 (35±1)	30	0.5-0.6	N/A
2	56±2 (35±1)		0.5-0.6	
3	56±2 (35±1)		0.5-0.6	
4	56±2 (35±1)		0.5-0.6	

Steering wheel angle that corresponds to a peak 0.5–0.6g lateral acceleration; 90 degrees

1 Hz 10 Cycle Sinusoidal Steering Maneuver				
Test Runs	Vehicle Speed (mph)	Steering Wheel Angle (degrees)	Target Peak Lateral Acceleration (g)	Observed Peak Lateral Acceleration (g)
1 - 3	56±2 (35±1)	90 (cycles 1-10)	0.5-0.6	0.55
4	56±2 (35±1)	90 (cycles 1-9)	0.5-0.6	0.55
		180 (cycle 10)*	N/A	0.86

* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.

REMARKS:

RECORDED BY: Alan Ida DATE: 4-23-09
APPROVED BY: Jeff Sankey DATE: 4-30-09

3.0 TEST DATA....continued

DATA SHEET 7 (1 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER

VEHICLE MAKE/MODEL/BODY STYLE: Lexus / ES350 / Passenger car

VEHICLE NHTSA No.: C95104 TEST DATE: 4-23-09

Wind Speed 1.3 m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 8.3 °C

Static Data File Number: 0006
Selected Drive Configuration: default - FWD
Selected Mode: default

Preliminary Left Steer Maneuver:
Lateral Acceleration measured at 30 degrees steering wheel angle ($a_{y,30\ degrees}$)

$a_{y,30\ degrees}$ = 0.267 g

Assuming a linear relationship the following ratio should be used to calculate the steering wheel angle at .55g.

$$\frac{30\ degrees}{a_{y,30\ degrees}} = \frac{\delta_{SIS}}{0.55\ g}$$

δ_{SIS} = 61.8 degrees @ 0.55g

δ_{SIS} = 60.0 degrees (rounded)

Steering Wheel Angle at Corrected 0.3 g Lateral Acceleration:

Maneuver #	Initial Steer Direction	Time Clock (5 min max between runs)	Steering Wheel Angle to nearest 0.1 degree (degrees)	All Conditions Met?
1	Left	10:19 am	-36.5	Yes
2	Left	10:22 am	-37.4	Yes
3	Left	10:25 am	-35.8	Yes
4	Right	10:33 am	36.2	Yes
5	Right	10:37 am	36.0	Yes
6	Right	10:40 am	36.1	Yes

3.0 TEST DATA....continued

DATA SHEET 7 (2 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER

Average Overall Steering Wheel Angle:

$$\delta_{0.3\ g,\ overall} = (|\delta_{0.3\ g,\ left\ (1)}| + |\delta_{0.3\ g,\ left\ (2)}| + |\delta_{0.3\ g,\ left\ (3)}| + \delta_{0.3\ g,\ right\ (1)} + \delta_{0.3\ g,\ right\ (2)} + \delta_{0.3\ g,\ right\ (3)}) / 6$$

$\delta_{0.3\ g,\ overall}$ = 36.3 degrees
[to nearest 0.1 degree]

REMARKS:

RECORDED BY: Alan Ida DATE: 4-23-09
APPROVED BY: Jeff Sankey DATE: 4-30-09

3.0 TEST DATA....continued

DATA SHEET 8 (1 of 3)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

VEHICLE MAKE/MODEL/BODY STYLE: Lexus / ES350 / Passenger car

VEHICLE NHTSA No.: C95104 TEST DATE: 4-23-09

Tire conditioning completed	X Yes	____ No
ESC system is enabled	X Yes	____ No
On track calibration checks have been completed	X Yes	____ No
On track static data file for each sensor obtained	X Yes	____ No

Selected Drive Configuration: default - FWD
Selected Mode: default

Overall steering wheel angle ($\delta_{0.3\ g,\ overall}$) 36.3 degrees
Static Data File Number 0016

Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle[1] (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [≤ 35%]		YRR at 1.75 sec after COS [≤ 20%]	
		Scalar	Angle	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/ Fail	%	Pass/ Fail
1	11:46 am	1.5* $\delta_{0.3\ g}$	54	11.75	-0.04	-0.05	-0.37	Pass	-0.42	Pass
2	11:49 am	2.0* $\delta_{0.3\ g}$	73	16.03	0.00	0.03	0.02	Pass	0.19	Pass
3	11:53 am	2.5* $\delta_{0.3\ g}$	91	19.58	-0.25	-0.14	-1.29	Pass	-0.69	Pass
4	11:56 am	3.0* $\delta_{0.3\ g}$	109	23.28	-0.09	0.01	-0.39	Pass	0.04	Pass
5	11:59 am	3.5* $\delta_{0.3\ g}$	127	27.42	-0.03	-0.04	-0.12	Pass	-0.16	Pass
6	12:02 pm	4.0* $\delta_{0.3\ g}$	145	31.89	-0.37	-0.32	-1.16	Pass	-0.99	Pass
7	12:06 pm	4.5* $\delta_{0.3\ g}$	163	36.21	-0.05	0.03	-0.15	Pass	0.08	Pass
8	12:09 pm	5.0* $\delta_{0.3\ g}$	181	39.47	-0.24	-0.09	-0.60	Pass	-0.23	Pass
9	12:12 pm	5.5* $\delta_{0.3\ g}$	200	43.26	-0.26	-0.14	-0.60	Pass	-0.32	Pass
10	12:15 pm	6.0* $\delta_{0.3\ g}$	218	45.52	-0.30	-0.20	-0.67	Pass	-0.44	Pass
11	12:18 pm	6.5* $\delta_{0.3\ g}$	236	48.53	-0.08	-0.06	-0.17	Pass	-0.13	Pass
12	12:21 pm	7.0* $\delta_{0.3\ g}$	254	49.69	-0.31	-0.18	-0.62	Pass	-0.36	Pass
13	12:25 pm	7.4* $\delta_{0.3\ g}$	270	51.66	-0.11	-0.15	-0.21	Pass	-0.28	Pass

1. Maneuver execution should continue until a steering wheel angle magnitude factor of 6.5*$\delta_{0.3\ g,\ overall}$ or 270 degrees is utilized, whichever is greater provided the calculated magnitude of 6.5*$\delta_{0.3\ g,\ overall}$ is less than or equal to 300 degrees. If 6.5*$\delta_{0.3\ g,\ overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of 0.5*$\delta_{0.3\ g,\ overall}$ without exceeding the 270 degree steering wheel angle.

3.0 TEST DATA....continued

DATA SHEET 8 (2 of 3)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

Lateral Stability Test Series No. 2 – Clockwise Initial Steer Direction

Maneuver #	Clock Time (1.5 – 5 min between each test run)	Commanded Steering Wheel Angle[1] (degrees)		Yaw Rates (degrees/sec)			YRR at 1.0 sec after COS [≤ 35%]		YRR at 1.75 sec after COS [≤ 20%]	
		Scalar	Angle	$\dot{\psi}_{Peak}$	$\dot{\psi}_{1.0sec}$	$\dot{\psi}_{1.75sec}$	%	Pass/ Fail	%	Pass/ Fail
1	12:29 pm	1.5* $\delta_{0.3\,g}$	54	-12.05	0.19	0.07	-1.54	Pass	-0.60	Pass
2	12:32 pm	2.0* $\delta_{0.3\,g}$	73	-16.59	-0.05	-0.02	0.30	Pass	0.10	Pass
3	12:36 pm	2.5* $\delta_{0.3\,g}$	91	-20.63	0.12	0.05	-0.61	Pass	-0.25	Pass
4	12:40 pm	3.0* $\delta_{0.3\,g}$	109	-25.00	-0.10	-0.18	0.41	Pass	0.70	Pass
5	12:43 pm	3.5* $\delta_{0.3\,g}$	127	-30.05	0.12	0.04	-0.39	Pass	-0.13	Pass
6	12:47 pm	4.0* $\delta_{0.3\,g}$	145	-35.03	0.11	0.02	-0.31	Pass	-0.05	Pass
7	12:50 pm	4.5* $\delta_{0.3\,g}$	163	-38.86	0.09	-0.09	-0.24	Pass	0.23	Pass
8	12:53 pm	5.0* $\delta_{0.3\,g}$	181	-41.51	0.34	0.08	-0.82	Pass	-0.18	Pass
9	12:57 pm	5.5* $\delta_{0.3\,g}$	200	-45.11	0.26	0.03	-0.59	Pass	-0.08	Pass
10	1:00 pm	6.0* $\delta_{0.3\,g}$	218	-47.45	0.04	0.03	-0.09	Pass	-0.07	Pass
11	1:03 pm	6.5* $\delta_{0.3\,g}$	236	-50.48	-0.05	-0.05	0.11	Pass	0.10	Pass
12	1:07 pm	7.0* $\delta_{0.3\,g}$	254	-52.73	-0.14	-0.13	0.26	Pass	0.24	Pass
13	1:10 pm	7.4* $\delta_{0.3\,g}$	270	-55.56	0.11	-0.05	-0.20	Pass	0.09	Pass

1. Maneuver execution should continue until a steering wheel angle magnitude factor of 6.5*$\delta_{0.3\,g,\,overall}$ or 270 degrees is utilized, whichever is greater provided the calculated 6.5*$\delta_{0.3\,g,\,overall}$ is less than or equal to 300 degrees. If 6.5*$\delta_{0.3\,g,\,overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of 0.5*$\delta_{0.3\,g,\,overall}$ without exceeding the 270 degree steering wheel angle.

During execution of the sine with dwell maneuvers were any of the following events observed?

Rim-to-pavement contact	_____ Yes	__X__ No
Tire debeading	_____ Yes	__X__ No
Loss of pavement contact of vehicle tires	_____ Yes	__X__ No
Did the test driver experience any vehicle loss of control or spinout?	_____ Yes	__X__ No

If "Yes" explain the event and consult with the COTR. _____

_____

_____

3.0 TEST DATA....continued

DATA SHEET 8 (3 of 3)
VEHICLE LATERAL STABILITY AND RESPONSIVENESS

Responsiveness – Lateral Displacement

Maneuver #	Initial Steer Direction	Commanded Steering Wheel Angle ($5.0*\delta_{0.3\,g,\,overall}$ or greater)		Calculated Lateral Displacement[1]	
		Scalar	Angle (degrees)	Distance (m)	Pass/Fail
8	Counter Clockwise	$5.0*\delta_{0.3\,g}$	181	3.01	Pass
9	Counter Clockwise	$5.5*\delta_{0.3\,g}$	200	3.07	Pass
10	Counter Clockwise	$6.0*\delta_{0.3\,g}$	218	3.19	Pass
11	Counter Clockwise	$6.5*\delta_{0.3\,g}$	236	3.23	Pass
12	Counter Clockwise	$7.0*\delta_{0.3\,g}$	254	3.22	Pass
13	Counter Clockwise	$7.4*\delta_{0.3\,g}$	270	3.25	Pass
8	Clockwise	$5.0*\delta_{0.3\,g}$	181	2.89	Pass
9	Clockwise	$5.5*\delta_{0.3\,g}$	200	3.00	Pass
10	Clockwise	$6.0*\delta_{0.3\,g}$	218	3.04	Pass
11	Clockwise	$6.5*\delta_{0.3\,g}$	236	3.06	Pass
12	Clockwise	$7.0*\delta_{0.3\,g}$	254	3.13	Pass
13	Clockwise	$7.4*\delta_{0.3\,g}$	270	3.15	Pass

1. Lateral displacement should be $\geq$ 1.83 m (6 ft) for vehicles with a GVWR of 3,500 kg (7,716 lb) or less; and $\geq$ 1.52 m (5ft) for vehicles with a GVWR greater than 3,500 kg (7,716 lb).

DATA INDICATES COMPLIANCE: PASS/FAIL PASS

REMARKS:

RECORDED BY: Alan Ida DATE: 4-23-09

APPROVED BY: Jeff Sankey DATE: 4-30-09

DATA SHEET 9
MALFUNCTION WARNING TEST

VEHICLE MAKE/MODEL/BODY STYLE: Lexus / ES350 / Passenger car

VEHICLE NHTSA No.: C95104 TEST DATE: 4-24-09

METHOD OF MALFUNCTION SIMULATION:
Describe method of malfunction simulation: 1) Disconnect Yaw Rate Sensor connector.
2) Remove VSC No. 2 Relay from underhood fuse box.

MALFUNCTION TELLTALE ILLUMINATION:
Telltale illuminates and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes.

X Yes _____No

Time for telltale to illuminate after ignition system is activated and vehicle speed of 48± 8 km/h (30± 5mph) is reached.
SEE REMARKS Seconds (must be within 2 minutes) X Pass _____ Fail

ESC SYSTEM RESTORATION:
Telltale extinguishes after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes.

X Yes _____No

Time for telltale to extinguish after ignition system is activated and vehicle speed of 48± 8 km/h (30± 5mph) is reached.
SEE REMARKS Seconds (must be within 2 minutes) X Pass _____ Fail

DATA INDICATES COMPLIANCE: PASS/FAIL PASS

REMARKS:

When the VSC Relay No. 2 is removed, the vehicle must be driven at 3 to 6 km/h in order for malfunction telltale to illuminate. After the relay is restored, the vehicle must be driven at 3 to 6 km/h in order for malfunction telltale to extinguish.

RECORDED BY: Alan Ida DATE: 4-24-09
APPROVED BY: Jeff Sankey DATE: 4-30-09

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

Type	Output	Range	Resolution	Accuracy	Specifics	Serial Number	Calibration
Tire Pressure Gauge	Vehicle Tire Pressure	0-60psi	0.5 psi	±0.5% of applied pressure	Marsh Model: 89562 0-60psi	N/A	By: TRC Date: 2-6-09 Due: 5-7-09
Platform Scales	Vehicle Total, Wheel, and Axle Load	0-2500 lb per each of four pads	0.5 lb	±1.0% of applied load	Mettler Toledo Model: JXGA1000	5225831-5JC	By: Mettler Date: 2-18-09 Due: 5-18-09
Automated Steering Machine with Steering Angle Encoder	Handwheel Angle	±800 deg	0.25 deg	±0.25 deg	Heitz Automotive Testing Model: Sprint 3	60303	By: TRC Date: 11-06-08 Due: 11-06-09
Multi-Axis Inertial Sensing System	Longitudinal, Lateral, and Vertical Acceleration Roll, Yaw, and Pitch Rate	Accelerometers: ±2 g Angular Rate Sensors: ±100 deg/s	Accelerometers: ≤10 ug Angular Rate Sensors: ≤0.004 deg/s	Accelerometers: ≤0.05% of full range Angular Rate Sensors: 0.05% of full range	BEI Technologies Model: MotionPAK MP-1	0767	By: BEI Tech. Date: 10-13-08 Due: 10-13-09
Radar Speed Sensor and Dashboard Display	Vehicle Speed	0-125 mph	0.009 mph	±0.25% of full scale	A-DAT Corp. Radar Model: DRS-6 Display Model: RD-2	1400437	By: A-DAT Date: 11-5-08 Due: 11-5-09
Ultrasonic Distance Measuring System	Left and Right Side Vehicle Height	5-24 inches	0.01 inches	±0.25% of maximum distance	Massa Products Corporation Model: M-5000/220	104619 & 104613	By: Consumers Energy Laboratory Services Date: 12-10-08 Due: 12-10-09
Data Acquisition System [Amplify, Anti-Alias, and Digitize]	Record Time; Velocity; Distance; Lateral, Longitudinal, and Vertical Accelerations; Roll, Yaw, and Pitch Rates; Steering Wheel Angle.	Sufficient to meet or exceed individual sensors	200 Hz	Sufficient to meet or exceed individual sensors	Dewetron Sidehand DAS Model: DA-121-16 Digitizer Model: Dewe-Orion-1616-100 Amplifier/AntiAliasing: MDAQ-FILT-10-S	12060 1105	By: Dewetron Date: 4-24-08 Due: 4-24-09
Load Cell	Vehicle Brake Pedal Force	0-300 lb	1 lb	±0.05% of full scale	DATRON Model: DTM-LPA	4970-1103	By: TRC Date: per test Due: per test
Coordinate Measurement Machine	Inertial Sensing System Location	0-10 feet	0.001 inch	±0.003% of full scale	FARO International Model: Faro Arm N10	U12-05-08-07108	By: FARO Date: 9-26-08 Due: 9-26-09
Outriggers	No output. Safety Item.	N/A	N/A	N/A	NHTSA Titanium Outriggers Model: Docket 2007-27662-11	N/A	N/A

5.0 PHOTOGRAPHS

5.1 ¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE
5.2 ¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE
5.3 VEHICLE CERTIFICATION LABEL
5.4 TIRE AND LOADING INFORMATION LABEL
5.5 WINDOW STICKER (MONRONEY LABEL)
5.6 ESC MALFUNCTION TELLTALE
5.7 SECONDARY ESC MALFUNCTION TELLTALE
5.8 ¾ FRONT VIEW - TEST VEHICLE INSTRUMENTED
5.9 ¾ REAR VIEW – TEST VEHICLE INSTRUMENTED
5.10 STEERING WHEEL CONTROLLER AND DATA ACQUISITION SYSTEM
5.11 STEERING CONTROLLER BATTERY BOX
5.12 INERTIA SENSOR
5.13 VEHICLE SPEED SENSOR
5.14 BODY ROLL SENSOR (DRIVER SIDE)
5.15 BODY ROLL SENSOR (PASSENGER SIDE)

2009 LEXUS ES350
FMVSS 126
VEHICLE No.: C95104
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5.1 ¾ FRONT VIEW FROM LEFT SIDE OF VEHICLE

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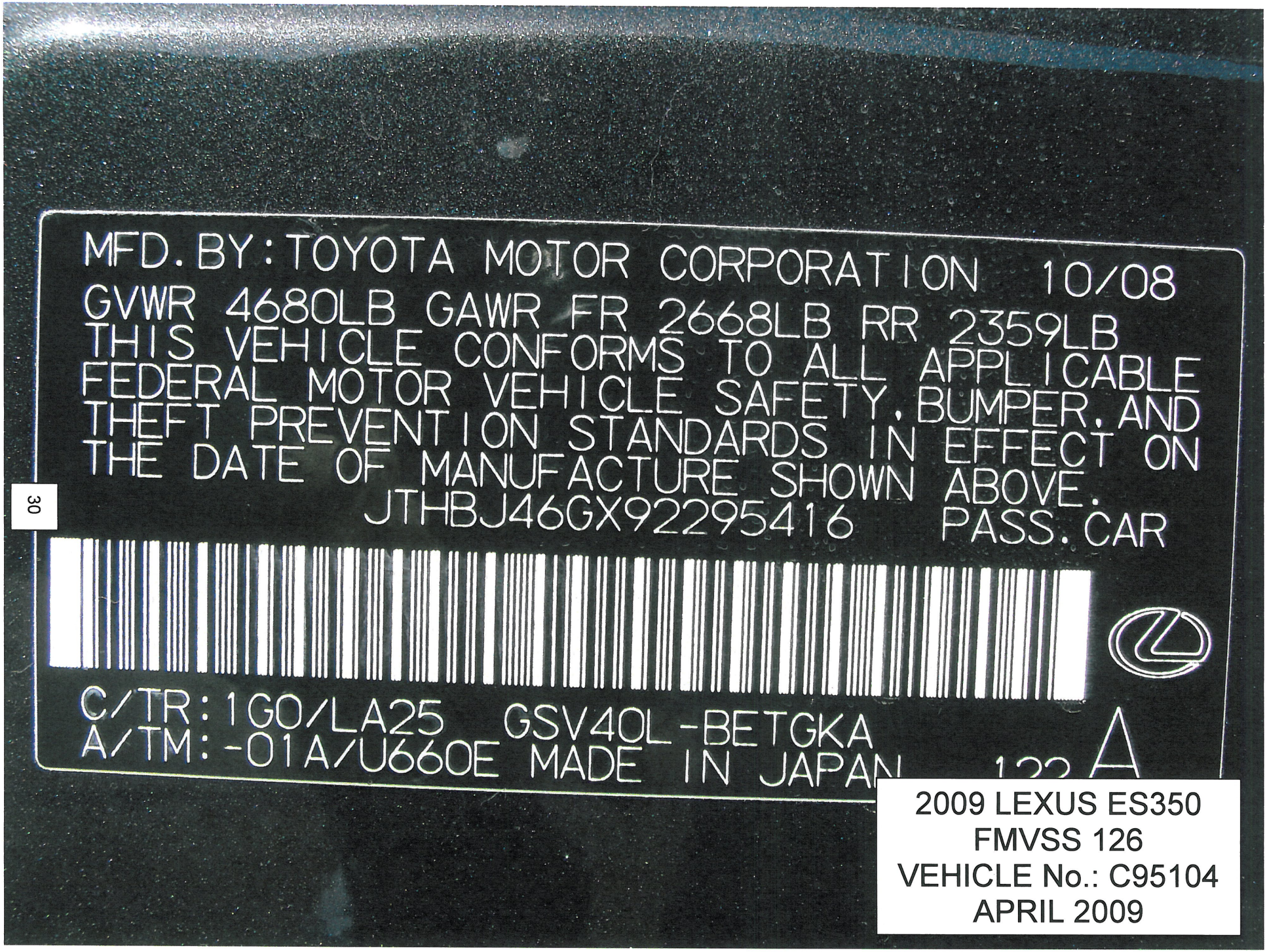
2009 LEXUS ES350
FMVSS 126
VEHICLE No.: C95104
APRIL 2009

5.2 ¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE



5.3 VEHICLE CERTIFICATION LABEL

LEXUS
The Pursuit of Perfection

DESCRIPTION	**2009 / 9000A ES350 4-DR SEDAN**
COLOR	SMOKY GRANITE MICA
VIN	JTHBJ46GX92295416
PORT/PLANT	Portland, OR

Dealer Name / Address:
GERMAIN LEXUS OF DUBLIN
3885 W. DUBLIN-GRANVILLE
DUBLIN OH43017

Ship to: (Dealer, unless otherwise indicated)

STANDARD EQUIPMENT & INSTALLED OPTIONS

PERFORMANCE FEATURES
- * 3.5 Liter 272HP Four Cam 24-Valve V6 Engine All-Aluminum Engine Construction & Dual VVT-i
- * 6-Speed Automatic Transmission w/Sequential Shift
- * Front Wheel Drive
- * Dual Exhaust with Chrome Finished Tips
- * 4-Wheel Independent MacPherson Strut-Type Suspension with Gas Pressurized Shock Absorbers Front and Rear Stabilizer Bar
- * 4-Wheel Power Assisted Ventilated Front/Solid Rear Disc Brakes
- * 17" Aluminum Alloy 7-Spoke Wheels
- * 215/55R17 All-Season Tires

SAFETY FEATURES
- * Dual Front Airbags, Dual Front Knee Airbags, Front Seat-Mounted Side Impact Airbags, Fr & Rr Side Curtain Airbags, Supplemental Restraint Sys (SRS) 3-Point Seatbelts for All Seating Positions
- * Fr & Rr Outboard Seatbelt Pretensioners with Force Limiters
- * Vehicle Stability Control (VSC) with TRAC
- * 4-Wheel Anti-Lock Braking System (ABS) with Electronic Brakeforce Distribution (EBD)
- * Energy Managing Crumple Zones, Side Door Beams
- * Theft-Deterrent System w/ Engine Immobilizer
- * Projector-Bulb Headlamps w/ Integrated Foglamps/ Daytime Running Lights (DRL)
- * Variable Intermittent Wipers with Mist Control
- * Tire Pressure Monitor System
- * Tool Kit and First Aid Kit

LUXURY AND CONVENIENCE FEATURES
- * SmartAccess with Push Button Start/Stop
- * 10-Way Power Adjustable Driver & Passenger Seats includes 2-way Power Lumbar
- * Electrochromic Auto-Dimming Interior Mirror
- * Heated Outside Mirrors
- * One-Touch Open/Close Pwr Tilt-and-Slide Moonroof
- * Automatic Dual Zone Climate Control
- * Automatic On/Off Headlamps
- * Lexus Premium Audio System w/In-Dash 6-Disc CD Player, Automatic Sound Levelizer (ASL) & MP3 Player Connectivity (miniplug) & 8-Speakers
- * Power Front and Rear Windows with Auto One-Touch Up/Down and Pinch Protection
- * Power Door Locks with Anti-Lock Out
- * Power Tilt/Telescoping Steering Wheel w/Audio & Display Functions & Column-Mounted Cruise Control
- * Key FOB-Integrated Multi-Function Remote Entry Sys
- * Rear Glass Imprinted Antenna w/FM Diversity Sys
- * Front Cup Holders with Adjustable Holder Ring
- * Rear Arm Rest with Cup Holders
- * Heavy-Duty Rear Window Defogger with Timer
- * Scheduled Maintenance Indicator Light
- * Lexus Personalized Settings
- * LED Interior Lighting
- * Carpeted Floor Mats

MANUFACTURER'S SUGGESTED RETAIL PRICE	**$ 34,320.00**
** Rear Seat Side Airbags	250.00
** Bluetooth Audio	300.00
** Full Size Spare	205.00
** Premium Plus Package Includes: Perforated Leather Trim Interior with Memory Driver's & Front Passenger's Seats, Outside Mirrors, and Power Tilt/Telescoping Steering Wheel, Heated and Ventilated Front Seats, Driver's Power Cushion Extender, Rain-Sensing Wipers (TOTAL MSRP VALUE OF OPTION $2,480.00)	1,280.00
** Wood & Leather Steering Wheel	330.00
** Preferred Accessory Package: Trunk Mat, Cargo Net and Wheel Locks	210.00
** All Weather Mats	109.00
SUB-TOTAL	$ 37,004.00
DELIVERY, PROCESSING AND HANDLING FEE	825.00
TOTAL	**$ 37,829.00**

APPLICABLE FEDERAL TAXES NOT INCLUDED

Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service.

License and title fees, state, local and applicable federal taxes, and dealer installed options and accessories are not included in the manufacturer's suggested retail price.

LEXUS NEW VEHICLE LIMITED WARRANTY
Limited warranty coverage highlights include
* 4YR / 50000 mile basic coverage
* 6YR / 70000 mile powertrain coverage
* 6YR / Unlimited mile corrosion perforation warranty

See your Warranty and Services Guide for details.

LEXUS IS PLEASED TO OFFER THE FOLLOWING OWNER SUPPORT PACKAGE WITH EACH NEW LEXUS
* 24 hour, 365 day/yr. roadside assistance plan
* Complimentary 1st and 2nd scheduled maintenance services
* Lodging for emergency breakdown 100 miles from home

EPA Fuel Economy Estimates

These estimates reflect new EPA methods beginning with 2008 models.

CITY MPG

19

Expected range for most drivers
16 to 22 MPG

Estimated Annual Fuel Cost
$ 2,935
based on 15,000 miles at $4.30 per gallon

Combined Fuel Economy
This Vehicle
22
11 — 46
All Midsize Cars

HIGHWAY MPG

27

Expected range for most drivers
22 to 32 MPG

Your actual mileage will vary depending on how you drive and maintain your vehicle.

See the FREE Fuel Economy Guide at dealers or www.fueleconomy.gov

GOVERNMENT SAFETY RATINGS

Frontal Crash	Driver	★★★★★
	Passenger	★★★★★

Star ratings based on the risk of injury in a frontal impact. Frontal ratings should ONLY be compared to other vehicles of similar size and weight.

Side Crash	Front seat	★★★★★
	Rear seat	★★★★

Star ratings based on the risk of injury in a side impact.

Rollover ★★★

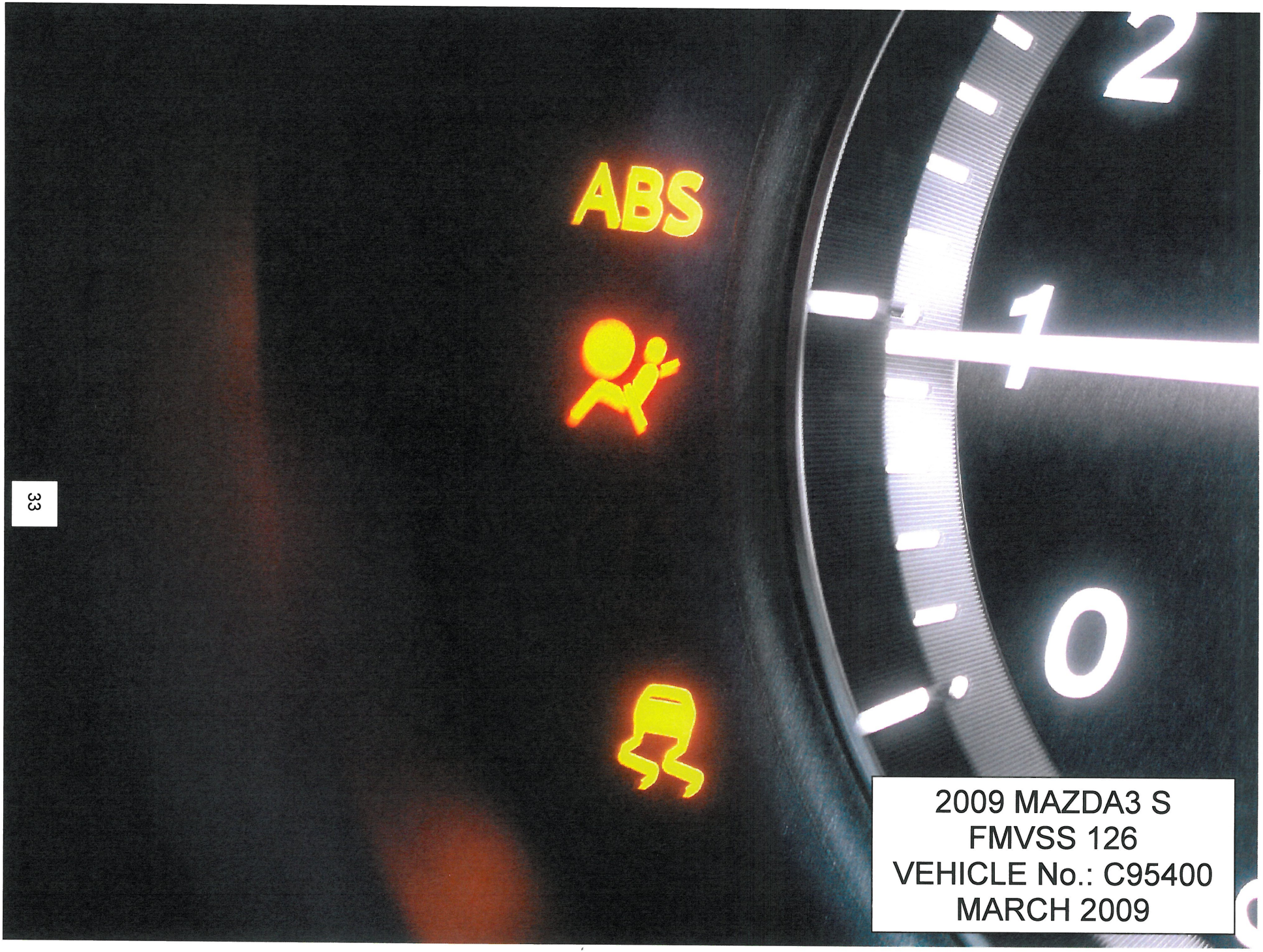
Star ratings based on the risk of rollover in a single vehicle cras

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the hi
Source: National Highway Traffic Safety Administration (NHTSA)

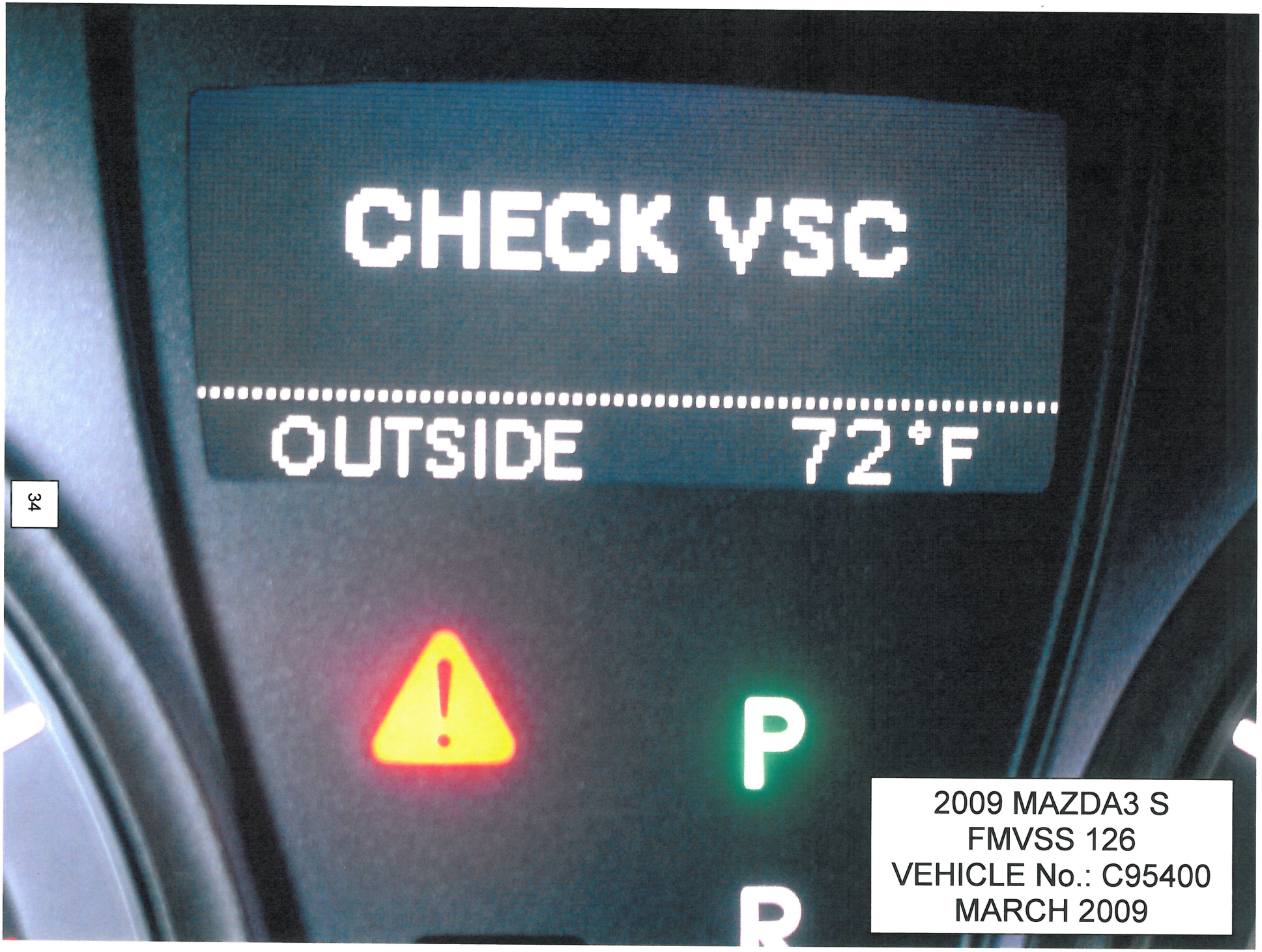
www.safercar.gov or 1-888-327-42

2009 LEXUS ES350
FMVSS 126
VEHICLE No.: C95104
APRIL 2009

5.5 WINDOW STICKER - MONRONEY LABEL



5.6 ESC MALFUNCTION TELLTALE



2009 MAZDA3 S
FMVSS 126
VEHICLE No.: C95400
MARCH 2009

5.7 SECONDARY ESC MALFUNCTION TELLTALE

5.8 ¾ FRONT VIEW - TEST VEHICLE INSTRUMENTED

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2009 LEXUS ES350
FMVSS 126
VEHICLE No.: C95104
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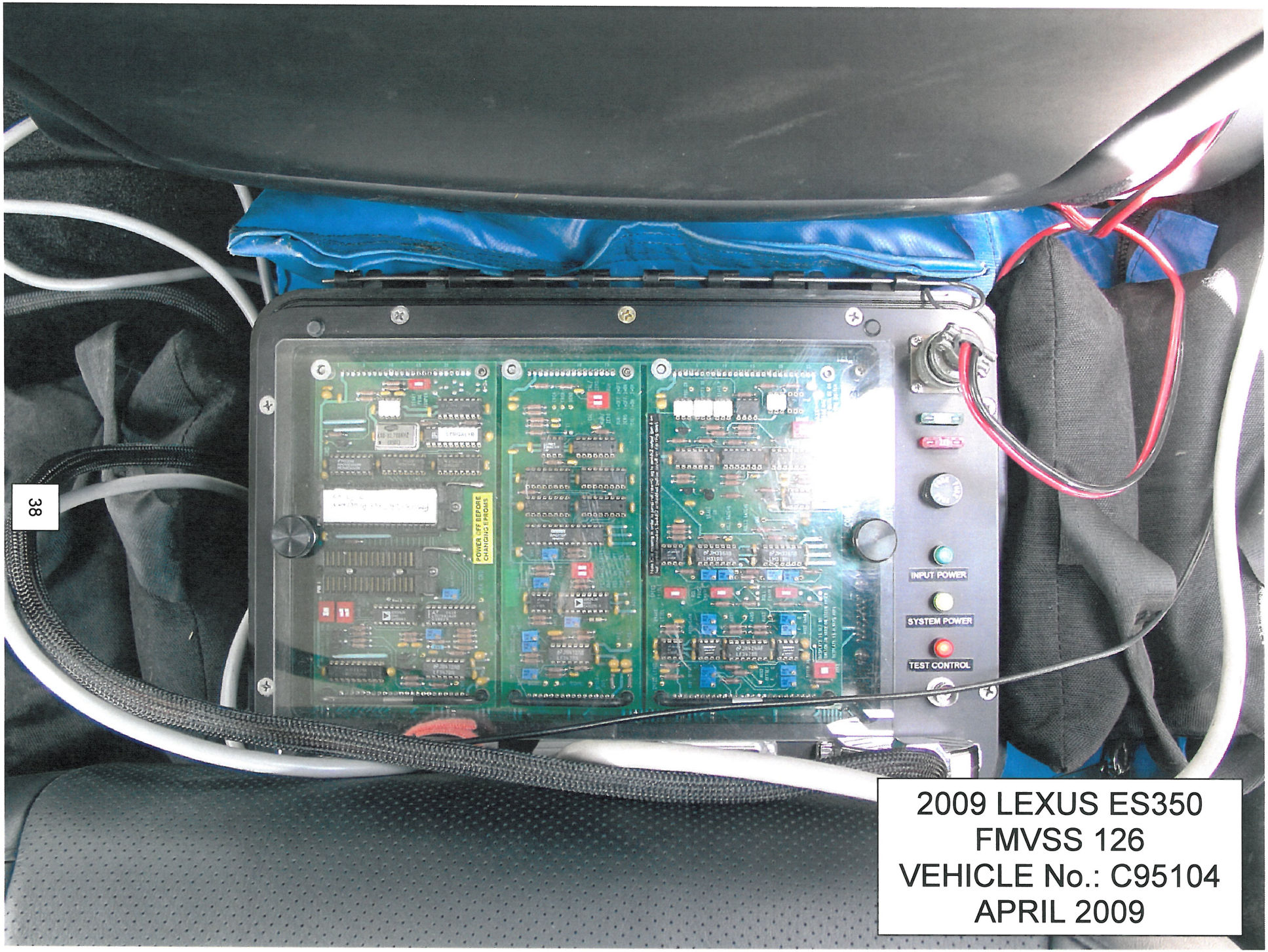
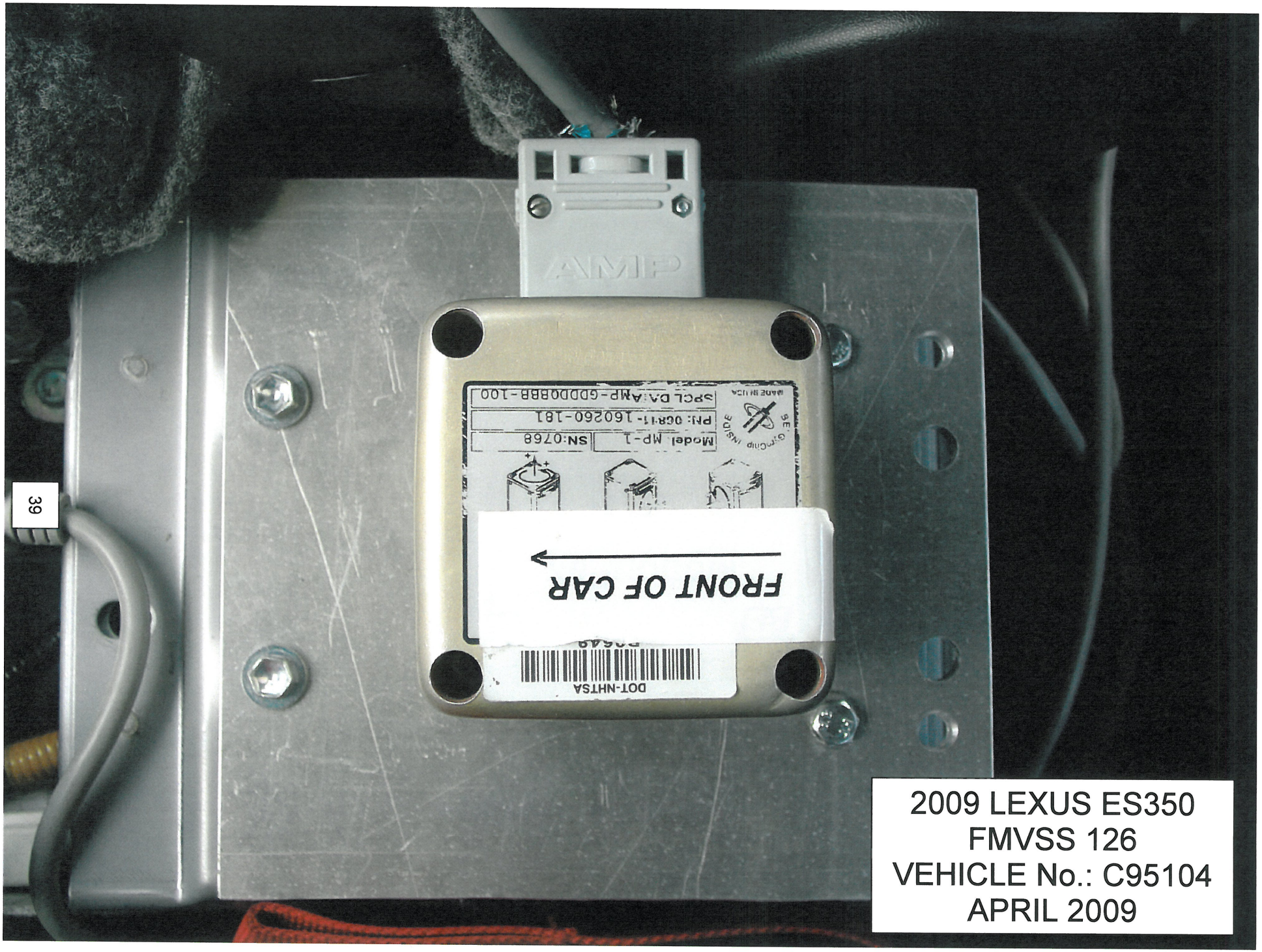
5.9 ¾ REAR VIEW - TEST VEHICLE INSTRUMENTED

2009 LEXUS ES350
FMVSS 126
VEHICLE No.: C95104
APRIL 2009

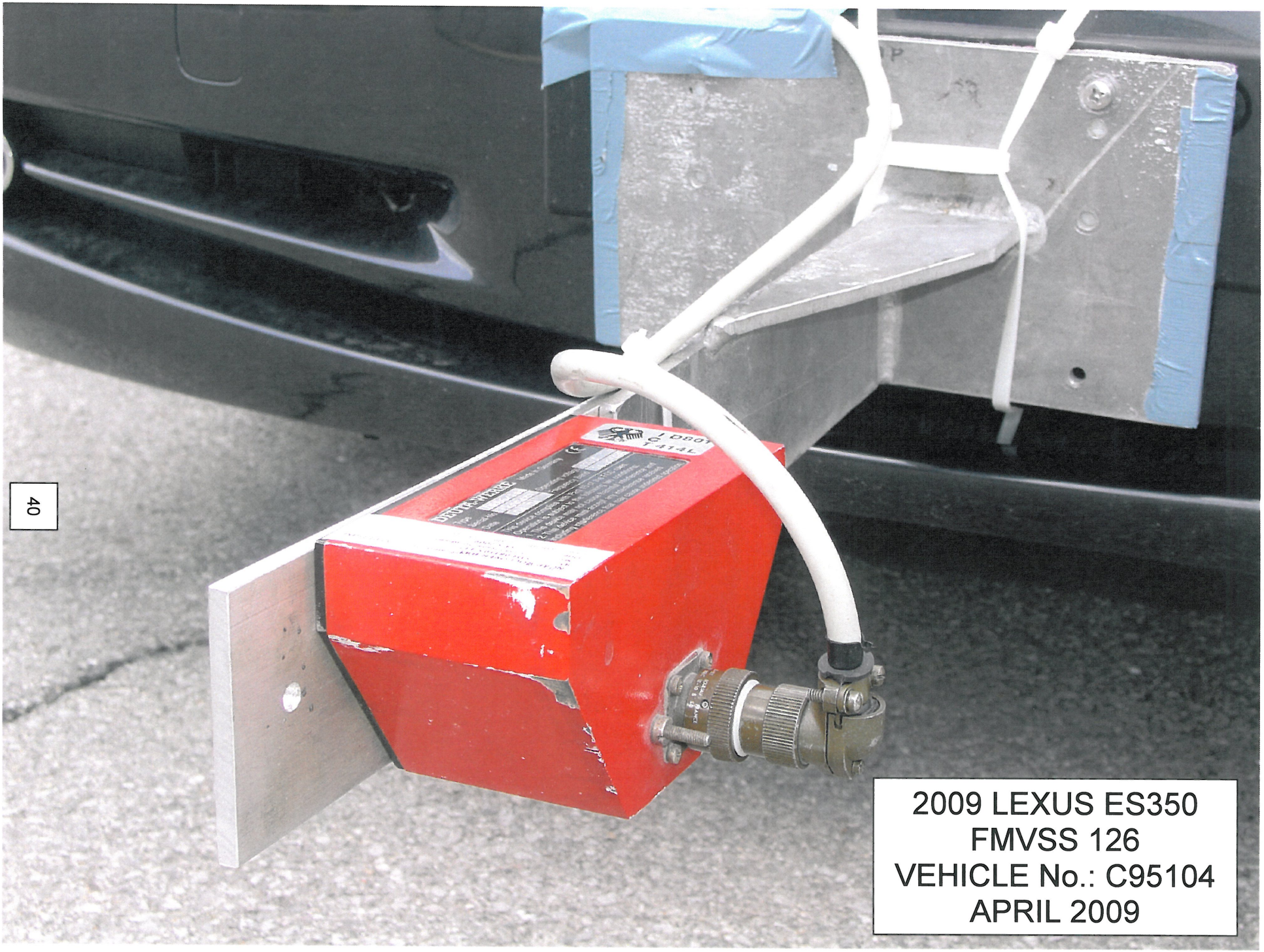
5.10 STEERING WHEEL CONTROLLER AND DATA ACQUISITION SYSTEM



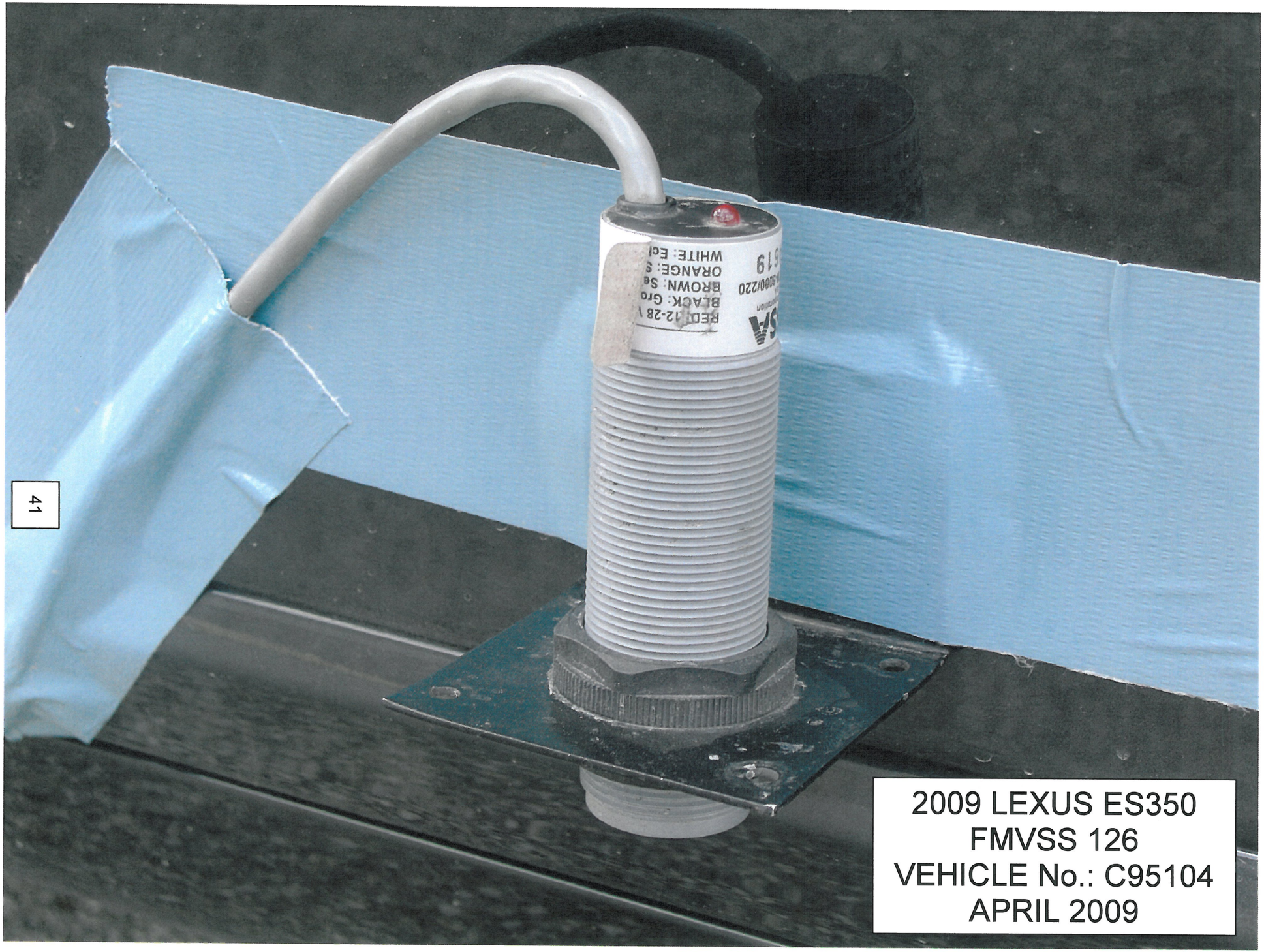
5.11 STEERING CONTROLLER BATTERY BOX



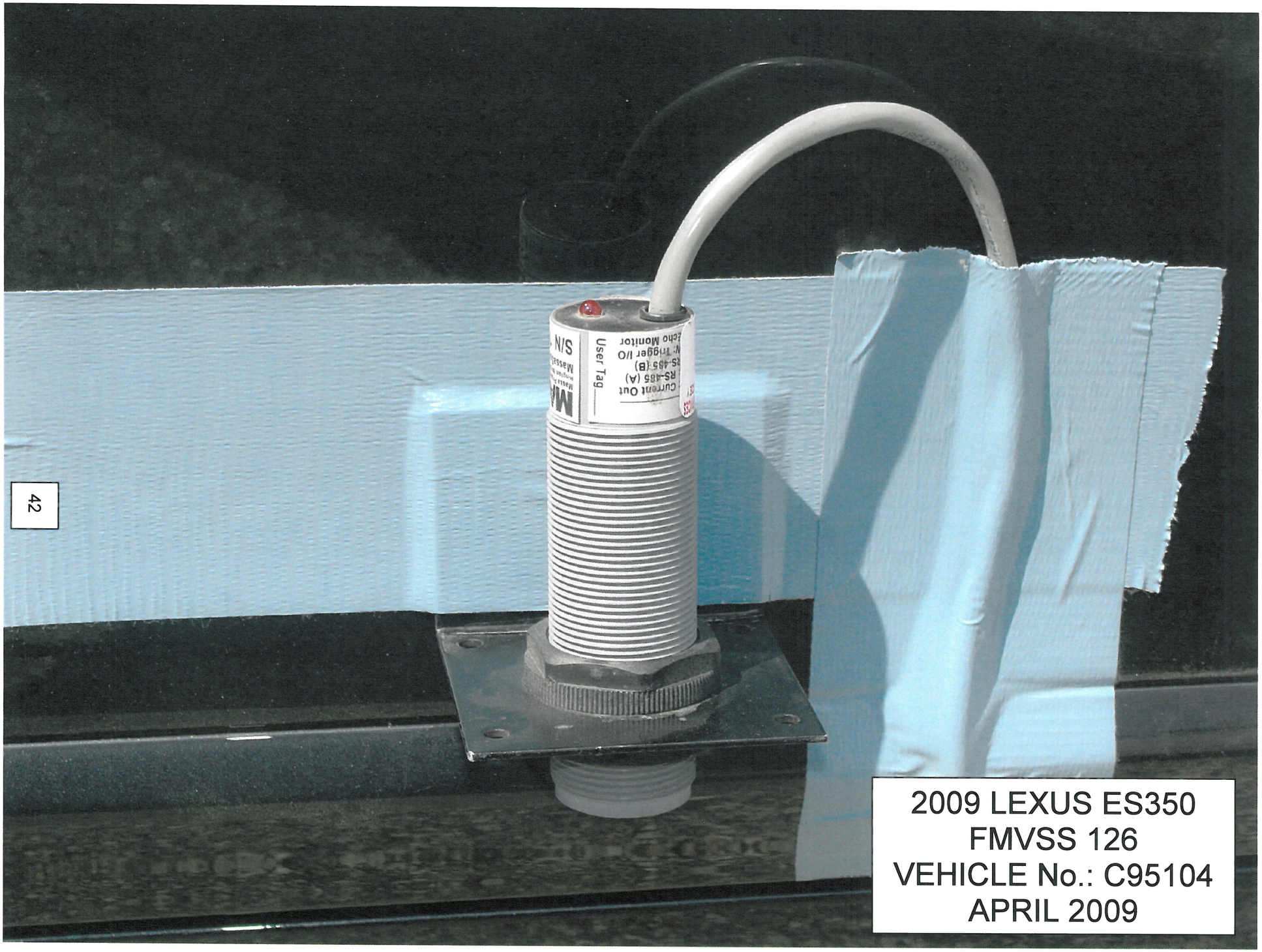
5.12 INERTIA SENSOR



5.13 VEHICLE SPEED SENSOR



5.14 BODY ROLL SENSOR (DRIVER SIDE)

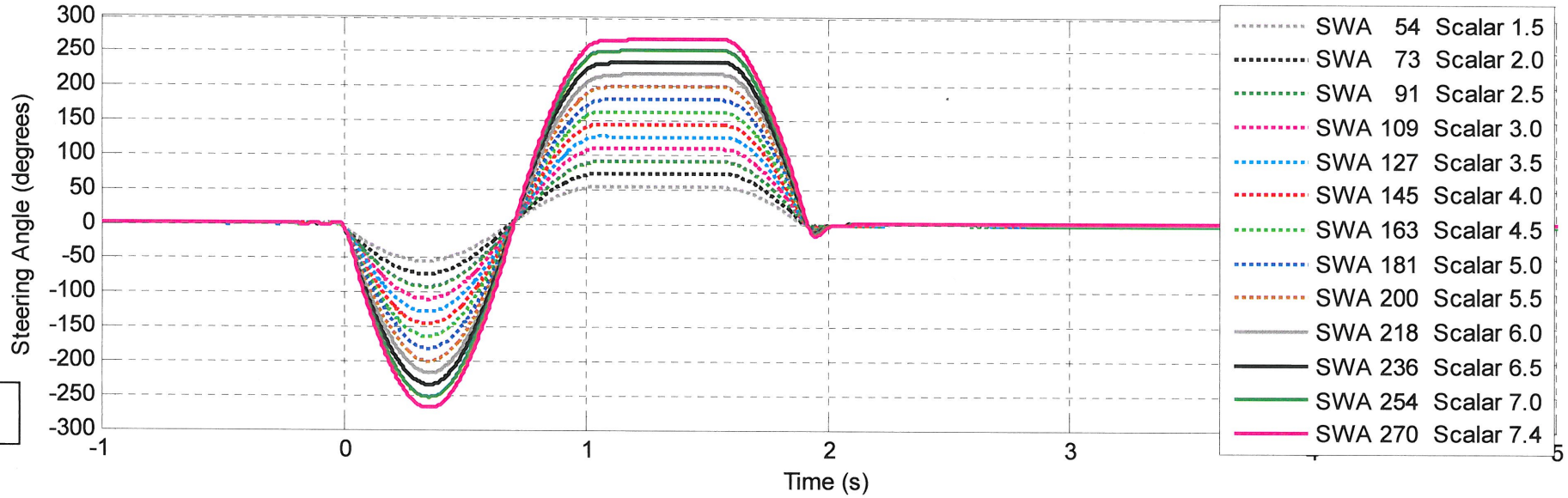


5.15 BODY ROLL SENSOR (PASSENGER SIDE)

6.0 DATA PLOTS

6.0 DATA PLOTS

Figure 1. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests



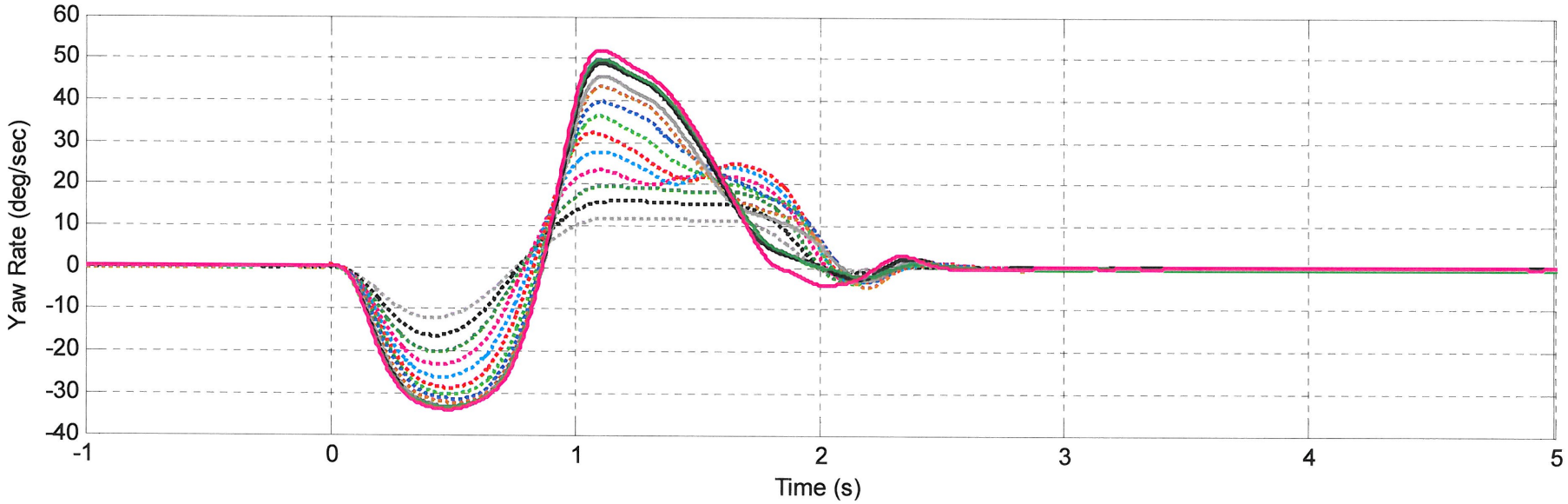
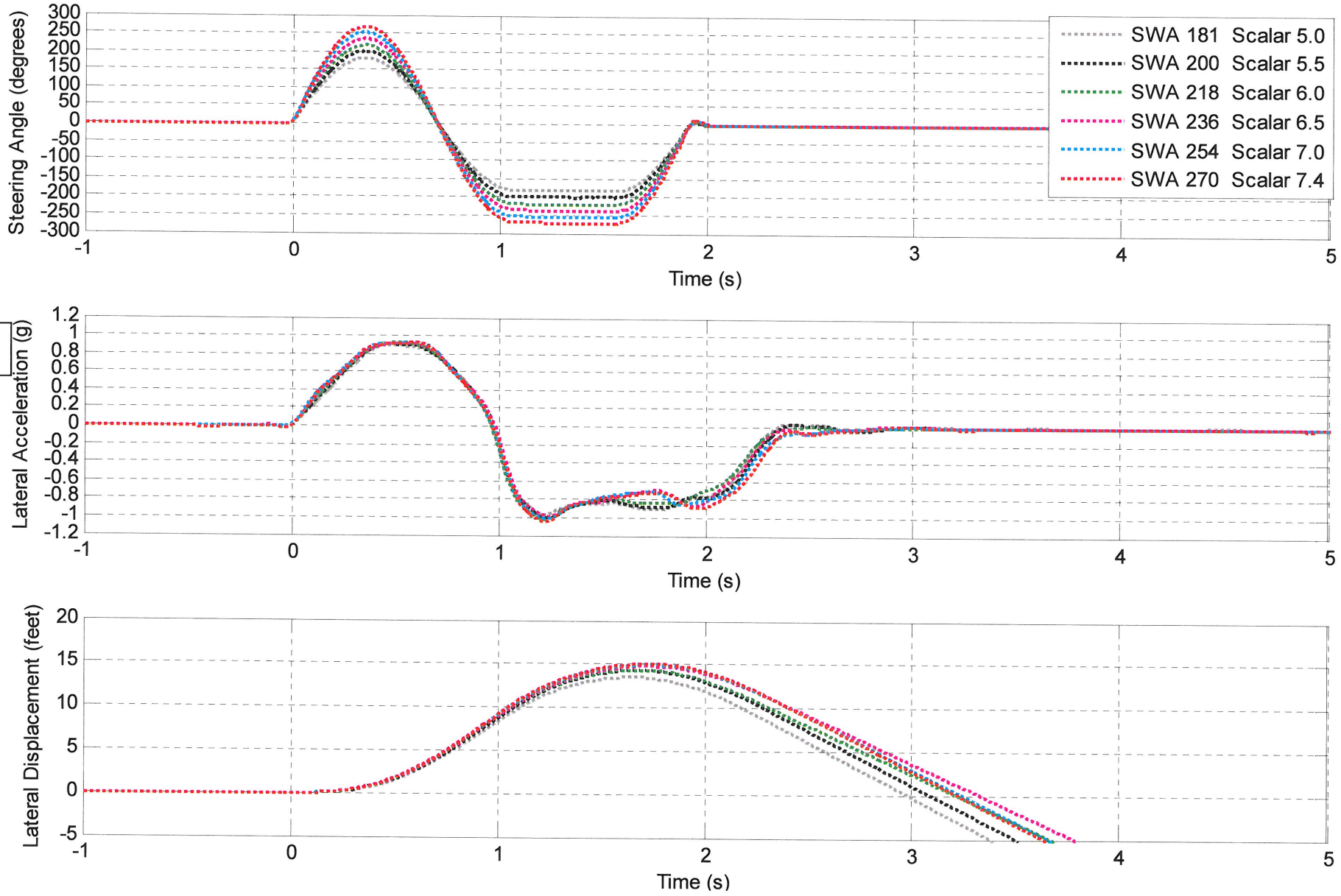


Figure 4. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests



7.0 OTHER DOCUMENTATION

7.1 OWNER'S MANUAL PAGES
7.2 VEHICLE ARRIVAL CONDITION REPORT
7.3 VEHICLE COMPLETION CONDITION REPORT
7.4 SINE WITH DWELL TEST RESULTS
7.5 SLOWLY INCREASING STEER TEST RESULTS
7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES

7.1 OWNER'S MANUAL PAGES

Driving assist systems

To help enhance driving safety and performance, the following systems operate automatically in response to various driving situations. Be aware, however, that these systems are supplementary and should not be relied upon too heavily when operating the vehicle.

ABS (Anti-lock Brake System)

Helps to prevent wheel lock when the brakes are applied suddenly, or if the brakes are applied while driving on a slippery road surface

Brake assist

Generates an increased level of braking force after the brake pedal is depressed, when the system detects a panic stop situation.

VSC (Vehicle Stability Control)

Helps the driver to control skidding when swerving suddenly or turning on slippery road surfaces.

TRAC (Traction Control)

Maintains drive power and prevents the front wheels from spinning when starting the vehicle or accelerating on slippery roads.

PCS (Pre-Collision System) (if equipped)

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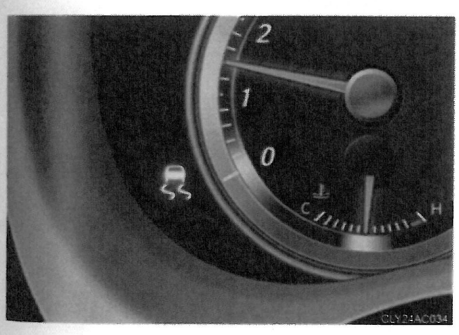
When the VSC and TRAC systems are operating



If the vehicle is in danger of slipping, or if the front wheels spin, the slip indicator light flashes to indicate that the VSC and TRAC systems have been engaged.

A buzzer (intermittent) sounds to indicate that VSC is operating.

Sounds and vibrations caused by the ABS, brake assist, VSC and TRAC systems

- A sound may be heard from the engine compartment when the engine is started or just after the vehicle begins to move. This sound does not indicate that a malfunction has occurred in any of these systems.
- Any of the following conditions may occur when the above systems are operating. None of these indicates that a malfunction has occurred.
  - Vibrations may be felt through the vehicle body and steering.
  - A motor sound may be heard after the vehicle comes to a stop.
  - The brake pedal may pulsate slightly after the ABS is activated.
  - The brake pedal may move down slightly after the ABS is activated.

⚠ CAUTION

Any of the following conditions may result in an accident which could cause death or serious injury:

The ABS does not operate effectively when

- The limits of tire gripping performance have been exceeded.
- The vehicle hydroplanes while driving at high speed on the wet or slick road.

Stopping distance when the ABS is operating will exceed that of normal conditions

The ABS is not designed to shorten the vehicle's stopping distance. Always maintain a safe distance from the vehicle in front of you in the following situations.

- When driving on dirt, gravel or snow-covered roads
- When driving with tire chains
- When driving over bumps in the road
- When driving over roads with potholes or roads with uneven roads

TRAC may not operate effectively when

Directional control and power may not be achievable while driving on slippery road surfaces, even if the TRAC system is operating.
Do not drive the vehicle in conditions where stability and power may be lost.

⚠ CAUTION

When the slip indicator flashes and a warning buzzer sounds

This situation occurs immediately while VSC is activated. Always drive carefully. Reckless driving may cause an accident. Exercise particular care when the indicator light flashes and a buzzer sounds.

Replacing tires

Make sure that all tires are of the same size, brand, tread pattern and total load capacity. In addition, make sure that the tires are inflated to the recommended tire pressure level.

The ABS and VSC systems will not function correctly if different tires are fitted on the vehicle.
Contact your Lexus dealer for further information when replacing tires or wheels.

7.2 VEHICLE ARRIVAL CONDITION REPORT

CONTRACT NO. DTNH22-08-P-0097 DATE: 12/16/08

FROM: Germain Lexus of Dublin, 3885 W. Dublin-Granville Road, Dublin, OH 43017

TO: TRC

PURPOSE: (X) Initial Receipt ( ) Received via Transfer ( ) Present vehicle condition

MODEL YEAR/MAKE/MODEL/BODY STYLE: 2009 / Lexus / ES350 / Pass car

MANUFACTURE DATE: 10/08 NHTSA NO.: C95104

BODY COLOR: Smoky Granite Mica VIN: JTHBJ46GX92295416

ODOMETER READING: 60 miles GVWR: 2,123 KG

PURCHASE PRICE: $ $37,829 DEALER'S NAME: German Lexus of Dublin, Dublin, Ohio

X ALL OPTIONS LISTED ON "WINDOW STICKER" ARE PRESENT ON THE TEST VEHICLE

X TIRES AND WHEEL RIMS ARE NEW AND THE SAME AS LISTED

X THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS

X THE VEHICLE HAS BEEN PROPERLY PREPARED AND IS IN RUNNING CONDITION

X THE GLOVE BOX CONTAINS AN OWNER'S MANUAL, WARRANTY DOCUMENT, CONSUMER INFORMATION, AND EXTRA SET OF KEYS

X PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

X PLACE VEHICLE IN STORAGE AREA

X INSPECT THE VEHICLE'S INTERIOR AND EXTERIOR, INCLUDING ALL WINDOWS, SEATS, DOORS, ETC., TO CONFIRM THAT EACH SYSTEM IS COMPLETE AND FUNCTIONAL PER THE MANUFACTURER'S SPECIFICATIONS. ANY DAMAGE, MISADJUSTMENT, OR OTHER UNUSUAL CONDITION THAT COULD INFLUENCE THE TEST PROGRAM OR TEST RESULTS SHALL BE RECORDED. REPORT ANY ABNORMAL CONDITION TO THE NHTSA COTR BEFORE BEGINNING ANY TEST

RECORDED BY: Alan Ida DATE: 12-16-08

APPROVED BY: Jeff Sankey DATE: 4-30-09

7.3 VEHICLE COMPLETION CONDITION REPORT

CONTRACT NO. DTNH22-08-P-0097 DATE: 4/24/09

MODEL YEAR/MAKE/MODEL/BODY STYLE: 2009 / Lexus / ES350 / Pass car

MANUFACTURE DATE: 10/08 NHTSA NO.: C95104

BODY COLOR: Smoky Granite Mica VIN: JTHBJ46GX92295416

ODOMETER READING: 121 miles GVWR: 2,123 KG

LIST OF FMVSS TESTS PERFORMED BY THIS LAB: 126

X THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS

X THE VEHICLE HAS BEEN PROPERLY MAINTAINED AND IS IN RUNNING CONDITION

X THE GLOVE BOX CONTAINS AN OWNER'S MANUAL, WARRANTY DOCUMENT, CONSUMER INFORMATION, AND EXTRA SET OF KEYS

X PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

REMARKS:

Equipment that is no longer on the test vehicle as noted on Vehicle Arrival Condition Report:
None.

Explanation for equipment removal:
N/A

Test Vehicle Condition:
Like new.

RECORDED BY: Alan Ida DATE: 4-24-09
APPROVED BY: Jeff Sankey DATE: 4-30-09

7.4 SINE WITH DWELL TEST RESULTS

2009 Lexus ES350

NHTSA No.: C95104

Date Created 23-Apr-09

File	SWA @ 5deg Ct	MES	Time@5deg	COS	Time@COS	MOS	Time@MOS	YRR1(%)	YR1 (deg/sec)	YRR1 Ct	YRR175(%)
17	616	50.44856714	3.073746999	997	4.979614987	754	3.760780515	-0.36532765	-0.042923489	1197	-0.42039192
18	615	50.19965966	3.06767881	997	4.979242742	754	3.76082211	0.016472988	0.002640568	1197	0.193861157
19	614	50.26922694	3.062914664	997	4.977974968	753	3.759497331	-1.291882589	-0.25300166	1197	-0.693719913
20	614	50.44937905	3.060549956	997	4.977631677	753	3.759074752	-0.392708308	-0.091430497	1197	0.043126581
21	613	50.25336548	3.058354983	997	4.976252353	753	3.758453654	-0.12396251	-0.033992447	1197	-0.159435425
22	614	50.20381689	3.061390674	997	4.97959406	754	3.762208212	-1.15973164	-0.369878594	1197	-0.994367696
23	613	50.42490965	3.056548831	996	4.974771475	753	3.758007089	-0.148766706	-0.053868034	1196	0.079098678
24	613	50.20798894	3.059885032	997	4.977591604	754	3.761591843	-0.604047269	-0.238406246	1197	-0.233404342
25	613	50.4012054	3.05754185	996	4.974690224	753	3.759225039	-0.602209688	-0.260508004	1196	-0.31551144
26	613	50.26784125	3.059156079	997	4.975789706	754	3.76044507	-0.665531245	-0.302963932	1197	-0.443383176
27	613	50.39793779	3.056530556	996	4.973184651	753	3.75769899	-0.166059873	-0.080590024	1196	-0.132912975
28	613	50.31034248	3.057693004	996	4.974023318	753	3.758864993	-0.624821398	-0.310463864	1196	-0.355491486
29	613	50.52072161	3.059317822	996	4.974902067	754	3.760042515	-0.214150649	-0.110638068	1196	-0.281647008
30	616	50.36049976	3.074601639	998	4.981555872	754	3.761376792	-1.535838873	0.185012964	1198	-0.601317001
31	615	50.33617559	3.066938794	997	4.979110415	753	3.759462848	0.299081329	-0.049624672	1197	0.103483162
32	614	50.32876729	3.064579917	997	4.979477309	754	3.761086292	-0.605219291	0.12484609	1197	-0.246611015
33	614	50.34963814	3.063225832	998	4.98065635	754	3.761816459	0.412466566	-0.103108966	1198	0.70135812
34	614	50.45776838	3.06184995	997	4.979745359	754	3.762080759	-0.394600695	0.118575984	1197	-0.133014561
35	613	50.22759944	3.058592407	997	4.976991644	753	3.759413757	-0.308363234	0.108006986	1197	-0.05410325
36	613	50.37559155	3.059166932	997	4.977237617	754	3.760528627	-0.23500589	0.091317775	1197	0.230879988
37	613	50.23211067	3.05922423	997	4.976726369	754	3.760634627	-0.822139742	0.341262814	1197	-0.180984654
38	613	50.42290417	3.057107945	996	4.974289025	753	3.758543863	-0.58573092	0.264195166	1196	-0.075317996
39	614	50.31522742	3.060377337	997	4.977451425	754	3.761721147	-0.087651262	0.041589102	1197	-0.071343729
40	613	50.31768595	3.058164335	997	4.975203188	753	3.759339998	0.105497138	-0.053252331	1197	0.099775528
41	614	50.37574428	3.060570423	997	4.977135398	754	3.761333971	0.256503645	-0.135265903	1197	0.241613202
42	613	50.23219674	3.057985982	996	4.974019895	753	3.758691738	-0.197556002	0.109771311	1196	0.094515237

7.4 SINE WITH DWELL TEST RESULTS

2009 Lexus ES350

NHTSA No.: C95104

Date Created 23-Apr-09

File	YR175 (deg/sec)	YRR175 Ct	2nd Yaw Peak(deg/sec)	2nd Yaw Peak Ct	Lat Disp (ft)	Lat. Acc. 1.07s (g)	1st SWA Peak(deg)	1st SWA Peak Ct	2nd SWA Mean(deg)
17	-0.049393162	1347	11.74931291	849	-3.93896603	0.393470696	54.02361259	682	53.94630699
18	0.031075327	1347	16.02968221	856	-5.184397479	0.506809192	72.98199979	682	72.87037737
19	-0.135857772	1347	19.58395155	840	-6.454275519	0.576584559	90.8746004	682	90.78278246
20	0.010040747	1347	23.28203799	833	-7.409102861	0.630241353	109.1422409	682	109.1584316
21	-0.043719672	1347	27.42155472	832	-8.286202841	0.646088941	127.1128239	682	127.1167099
22	-0.317138304	1347	31.89346406	828	-9.063336764	0.679098446	144.9732481	683	145.1202377
23	0.028641424	1346	36.20973756	832	-9.459998375	0.688417177	162.9822026	682	162.9029029
24	-0.092120362	1347	39.46814401	834	-9.873070786	0.693500284	180.9409443	683	180.7813136
25	-0.136486106	1346	43.25868701	835	-10.08508771	0.700349883	200.0904912	682	200.0359571
26	-0.201837422	1347	45.52212006	835	-10.47857729	0.67119792	217.5456569	684	218.0636726
27	-0.064503602	1346	48.53070328	834	-10.60352354	0.683955933	235.0028443	683	235.9131097
28	-0.176638093	1346	49.68841736	834	-10.56120733	0.707996824	252.2686661	684	253.7292357
29	-0.145509159	1346	51.66366239	834	-10.67178126	0.71694274	267.8531988	683	269.5574566
30	0.072436922	1348	-12.0463785	861	3.837476281	-0.401124439	54.6275239	682	54.5668393
31	-0.017170306	1347	-16.59236704	843	5.125703998	-0.505867019	73.68932568	682	73.38854249
32	0.050871513	1347	-20.6282404	839	6.156267061	-0.586575028	91.73562651	682	91.19712342
33	-0.175326479	1348	-24.99813914	831	7.194849646	-0.637370419	109.9415351	682	109.6427987
34	0.039970362	1347	-30.04961365	833	7.968247133	-0.655094727	127.9721076	682	127.5507336
35	0.018950148	1347	-35.0258961	833	8.662318535	-0.675789749	145.9232795	682	145.4689417
36	-0.089714547	1347	-38.85765381	835	9.11289378	-0.658828804	163.8762667	682	163.3653114
37	0.075125103	1347	-41.5091008	837	9.474216661	-0.686927632	181.7413797	682	181.30987
38	0.033972341	1346	-45.10521076	838	9.842053233	-0.678140427	200.7766526	682	200.6385113
39	0.033851442	1347	-47.44837759	837	9.969788247	-0.719029956	218.515693	683	218.6655084
40	-0.050364205	1347	-50.47751252	839	10.04266525	-0.653934041	235.8592001	683	236.5312211
41	-0.127413503	1347	-52.7344953	838	10.26517358	-0.689088525	253.0221637	684	254.4701703
42	-0.052517066	1346	-55.56465502	838	10.34215571	-0.69494471	268.6046496	683	270.3287502

7.5 SLOWLY INCREASING STEER TEST RESULTS

2009 Lexus ES350

NHTSA No.: C95104

Date Created 23-Apr-09

File	Vehicle	EventPt	DOS	MES [mph]	Mean SPD [mph]	AYcount_3	THETAENCF_3 [degree]	AYCG_CD2_3 [g]	r_squared	ZeroBegin	ZeroEnd
9	2009 Lexus ES350	635	1	49.77206988	50.0155536	1246	-36.52994342	-0.301135628	0.999123327	435	635
10	2009 Lexus ES350	593	1	50.53761533	49.86817466	1261	-37.39571327	-0.301423135	0.99953365	393	593
11	2009 Lexus ES350	694	1	50.20567109	50.16413687	1234	-35.75134969	-0.29790162	0.996973015	494	694
13	2009 Lexus ES350	701	0	50.45615932	50.22073861	1232	36.17204804	0.293637858	0.998242027	501	701
14	2009 Lexus ES350	700	0	50.11616122	49.95593887	1228	35.95315363	0.297921508	0.99876394	500	700
15	2009 Lexus ES350	700	0	50.36964857	50.19416687	1230	36.06444222	0.297867851	0.999387442	500	700
	Averages						36.3	0.2983146			

Scalars	Steering Angles (deg)
1.5	54
2	73
2.5	91
3	109
3.5	127
4	145
4.5	163
5	181
5.5	200
6	218
6.5	236
7	254
7.4	270

7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES

2009 Lexus ES350

NHTSA No.: C95104

Device : U12-05-08-07108
device version : 2.24
device certification date : 09/26/08
today is : 4/22/2009
units : Millimeters

Label	ActualX	ActualY	ActualZ
C_DEVICEPOS001			
M_PLANE001	1693.054	-610.1151	-305.6238
M_LINE001	603.8171	130.1777	-114.5046
M_FRONT_AXLE_CENTER	0	0	0
C_COORDSYS001	0	0	0
M_TIRE_TREAD_CENTER	251.8645	77.7623	-223.3856
M_INERTIA_PACK	1494.505	870.4082	222.9335
M_ROOF	1757.409	859.7295	1126.073
M_GROUND	1757.194	-172.727	-305.4357
Track Width		1584.325	
Roof Height (relative to ground)			1431.509
Motion Pak - x-distance	1494.505		
Motion Pak - y-distance		0.4834	
Motion Pak - z-distance			483.9192
Motion Pak - x-distance (inches)	58.839		
Motion Pak - y-distance (inches)		0.019	
Motion Pak - z-distance (inches)			19.052